



THE ZOOPLANKTON DIVERSITY AND COMPOSITION IN KORI DAM OF BILASPUR, CHHATTISGARH, INDIA

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ABSTRACT

Zooplankton are used to assess the environmental condition of bodies of water. The amount of zooplankton present is an indication of how productive a water body is. Revealing the quantity and variety of zooplankton in a water body can confirm its overall health. This current research explores the makeup and variety of zooplankton in the Kori dam located in Bilaspur, Chhattisgarh. The water samples were collected, once in a month, in the morning hours between 9:00AM and 11:00AM at four different sites (Site-I, Site-II, Site-III and Site-IV) of the dam. The surface water samples were filtered through a plankton net consisting of bolting silk cloth no. 20 to collect them. The planktons were then carefully placed on a slide, and the counting was conducted using a microscope. Throughout the study duration from July 2022 to June 2023, a total of 26 zooplankton species were discovered in various locations within Kori dam. The zooplankton species found in Kori dam comprised 15 rotifers, 2 protozoa, 5 cladocera, and 4 copepoda. Among the four zooplankton groups, rotifers were the most prevalent, constituting 57.19% of the total number of organisms, followed by protozoa at 19.04%, cladocera at 11.63%, and copepoda at 12.14% respectively. The overall The diversity indices indicate that there is a wide variety of zooplankton groups in this body of water, with the exception of protozoa, which had the lowest diversity indices values and the lowest abundance. To preserve the floral and faunal diversity in the future, it is necessary to implement a conservative strategy for this water body.

KEYWORDS: Kori dam, Zooplanktons, Diversity, Composition

INTRODUCTION

Zooplankton populations are an important reflection of aquatic systems, according to Kumar et al. (2010). They are valuable indicators of environmental quality in lakes and rivers. Changes in environmental conditions, nutrient enrichment, and pollution levels can significantly impact their distribution, species composition, and community structure (Jha and Barat, 2003). The abundance of zooplankton in the water is closely linked to productivity and water quality, making it an important indicator. Zooplankton play a central role in aquatic food webs. They do not only form an integral part of the lentic community but also contribute significantly, the biological productivity of the fresh water ecosystem. The importance of the Zooplankton is well recognized as these have vital part in food chain and play a key role in cycling of organic matter in an aquatic ecosystem. If the composition of any aquatic ecosystem is known then the next step is to assess its diversity and structure.

The biodiversity studies have been gaining a tremendous importance in current day's research, where collection of primary scientific data related to flora and fauna is important. If these researches aren't done, many of the organisms may go unrecorded or unnoticed. Hence becomes essential to maintain a record about the studies of organisms (Raut and Pejaver, 2005). The diversity is a measure that how likely two randomly selected species in a community are interrelated to the different species. Thus, diversity is influenced by the richness and the evenness of the species (Krebs, 1999). The diversity of a species tend to be low in stressed and polluted ecosystem and the diversity of zooplanktons was observed

to get influenced by the different water quality parameters (Chandrashekhar,1996). Information on species diversity, richness, evenness and dominance is considered to be essential to understand the environment and deterioration of water quality (Krishnamoorthy and Subramanian, 1999).

The diversity of a species is basically the measure of community structure and the organization forming the most important parameter to understand the health status of the ecosystem. The different diversity indices explains that how the individuals in the community are distributed (Prasad, 2003). Shah and Pandit (2013) noted in their work on Wular Lake of Kashmir, that the diversity index can be used as a biocriteria for the interpretation of the environmental status, as well as to measure of the degree of uncertainty within the community. The total number of species in a specific community always forms an unambiguous index of species richness, but it depends on the sample size and the time spend on searching its use (Yapp, 1979). Hence, there are many important diversity indices which are frequently used for the interpretation of the community studies. They include; Simpsons diversity index, Shannon's diversity Index, species richness index and species evenness index. These diversity indices are based on the relationship between the total number of species within a specific group/population /community and the total number of individuals observed which increases with the increasing sample size. The present investigation aims to investigate the composition and diversity of different zooplankton groups of Kori dam. Once the work is done t will help in providing a database for the water management of this freshwater body.

MATERIALS AND METHODS:

Kori dams bears a diverse biological communities. In order to determine the status of these dams the qualitative and quantitative aspects should be disclosed. Once we know the status of the biological communities of any aquatic ecosystem, then we are able to determine its need of conservation and protection. In the present study the diversity of the biological communities of the said aquatic ecosystem are assessed as follows;

3.1. Sample collection and analysis of zooplankton community

The study of composition and diversity of zooplanktons Kori dam of Bilaspur, Chhattisgarh was carried out during July-2022 to Dec-2023. It involved the measurement of both qualitative and quantitative parameters. The samples were collected, once in a month, in the morning hours between 9:00AM and 11:00AM at four different sites (Site-I, Site-II, Site-III and Site-IV) of Kori dam. The samples were collected by filtering surface water through plankton net which was made up of bolting silk cloth no. 20. The samples were handled with extreme precautions to keep water undisturbed at the time of sampling. After the collection of samples the samples were preserved in 4% formalin (Anderson, 1971). Finally the preserved samples were brought to laboratory for qualitative and quantitative analysis. The zooplanktons were identified by the protocols and methods given by Battish (1992) and Zeynep et al. (2019).

The quantitative studies the samples were properly agitated to distribute the organisms evenly and placed in Sedgwick rafter cell. Then by using a pipette, one ml of sample was transferred onto the cell. The cover slip was placed properly in order to avoid any air bubble. The planktons were allowed to settle, and then the counting of the planktons was made under microscope. The counting of the planktons was made by placing all of the planktons in the Sedgwick rafter cell and counted by moving the cell, vertically and horizontally, covering the whole area. The mean numerical density of the zooplankton is computed as individual per liter and relative composition of major groups are expressed in terms of percentage to total density.

3.2. Identification of zooplanktons

Detailed taxonomic identification of the zooplanktons in Kori dam was carried out by following Sehgal et al. (2013), Sharma and Rakhi (2018) and Nimbalkar and Pawar (2018)

3.3. Analysis of zooplankton community

The structure and functioning of aquatic ecosystem and impact of nature or anthropogenic activities has a merged understanding. As in the present investigation we calculate the Shannon-Wiener Index (H) given by Shannon and Wiener (1947), Species richness or Margalef's diversity index (d) given by Margalef, (1958), Simpsons diversity index (c) given by Simpson, (1949) and Species Evenness (e) given by (Pielou, 1977) as of the zooplankton communities of Kori dam of Chhattisgarh

3.4. Data Analysis

The data were tabulated and statistically analyzed by the

analyses of variance (ANOVA) and the treatment means were compared using the Duncan Multiple Range Test (Duncan, 1965) at ($P \leq 0.05$) level of significance.

RESULTS

In the present study the quantitative analysis of the zooplankton in the surface water of Kori dam, Bilaspur, Chhattisgarh revealed their occurrence and dynamics during 2022. In Kori dam the obtained members of zooplanktonic population was rotifera, protozoa, cladocera and copepod (Table 1). A total 26 zooplankton species were seen at different sites of Kori dam during the study period. The zooplankton species present in Kori dam included rotifer (15), protozoa (02), cladocera (05) and copepoda (04). They were identified to be as; *Brachionus angularis*, *Brachionus forficula*, *Brachionus falcatus*, *Brachionus calyciflorus*, *Brachionus caudatus*, *Brachionus diversicornis*, *Cephalodella species*, *Euclanis species*, *Filinia species*, *Keratella tropica*, *Keratella tecta*, *Keratella cochlearis*, *Keratella procurva*, *Lecane species*, *Monostyla species*, *Centrophxis species*, *Diffugia species*, *Bosmina species*, *Chydorus species*, *Daphnia species*, *Moina species*, *Diaphanosoma species*, *Mesocyclops species*, *Microcyclops species*, *Paracyclops species* and *Thermocyclops species*. The rotifer were the most abundant of the four zooplankton groups comprising 57.19% of the total number of organisms, followed by the protozoa (19.04%), cladocera (11.63%) and copepoda (12.14%) respectively. The zooplanktons of the Kori dam belonging to four groups administrated the sequence; Rotifer > Cladocera > Copepod > Protozoa. The overall composition of the zooplanktons record a significant variation across different zooplankton groups. The average diversity indices of different zooplankton groups in Kori dam and during July-2022 to Dec-2023 are given in Fig 1. The data reveals that in Kori dam highest Simpsons index was obtained by rotifer (0.890) and it was followed by copepoda (0.722), cladocera (0.680) and protozoa (0.566) respectively. Since the obtained values were higher for rotifera, copepoda and cladocera in contrast the values were lower for protozoa. The higher values reflects diversified resources in the Kori dam ecosystem. Whereas lower values indicate increase by an average species resulting in lowering the number of coexistence species in the community. The higher values of Simpson's diversity index reflect diversified resources in the Kori dam ecosystem. Whereas lower values indicate increase by an average species resulting in lowering the number of coexistence species in the community.

The average annual Shannons diversity indices different groups of zooplanktons in Kori dam are presented in Fig 2. This index is one of the best indices for making comparison of diversity components. The value of this index can theoretically range from zero to infinity. But, the value of this index normally varies from 0 to 4 respectively. These Diversity indices provide important information about rarity and commonness of zooplankton species in a community. The ability to quantify diversity in this way is an important tool for biologists trying to understand community structure. In the present study the annual average Shannon's diversity index of Kori dam was rotifer (2.043), protozoa (1.00), cladocera (1.250) and copepoda (1.229). The higher values were noted by copepoda and lower

values were obtained under rotifers. The higher values of a specific group determine that the group has evenly distributed and structured in a community/ecosystem and vice versa. Low value of Shannon's diversity index was recorded in protozoa and ostracoda. Karuthapandi *et al.* (2013) reported the overall zooplankton diversity index in Safilguda tank, is between 0.61 and 0.76, indicates less diversity of plank tonic community in the tank.

ORDER	FAMILY	SPECIES	STATION			
			I	II	III	IV
Rotifera	Brachionidae	Brachionus angularis	+	+	+	-
		Brachionus forficula	-	+	+	+
		Brachionus falcatus	-	-	+	+
		Brachionus calyciflorus	+	+	-	-
		Brachionus caudatus	-	+	-	+
		Brachionus diversicornis	+	-	-	-
		Cephalodella sp.	-	-	+	-
		Euclanis sp.	+	+	-	-
		Filinia sp.	-	-	-	+
		Keratella tropica	+	+	-	+
		Keratella tecta	+	-	+	+
		Keratella cochlearis	+	-	-	-
		Keratella procurva	+	+	-	-
		Lecane sp.	-	+	-	-
			-	-	+	+
Protozoa	Centropxyidae	Centrophxis sp.	+	+	+	-
	Difflogidae	Difflogia sp.	+	+	-	+
Cladocera	Bosminidae	Bosmina sp.	-	-	+	+
		Chydorus sp.	-	+	-	-
	Daphnidae	Daphnia sp.	+	+	-	-
		Moina sp.	-	-	+	-
		Diaphanosoma sp.	+	+	-	+
Copepoda	Cyclopidae	Mesocyclops sp.	+	-	-	-
		Microcyclops sp.	-	+	+	-
		Paracyclops sp.	-	+	-	-
		Thermocyclops	-	+	-	-

TABLE 1. Different zooplankton species and their distribution at different sampling sites of Kori Dam, Bilaspur, Chhattisgarh during 2022.

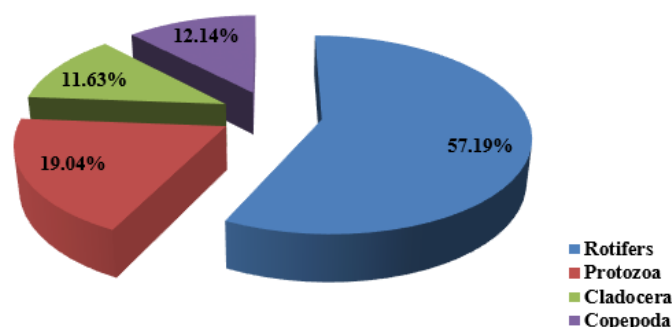


Fig 1. Percentage composition of zooplankton species at Kori Dam, Bilaspur, Chhattisgarh during July 2022 to Dec-2023.

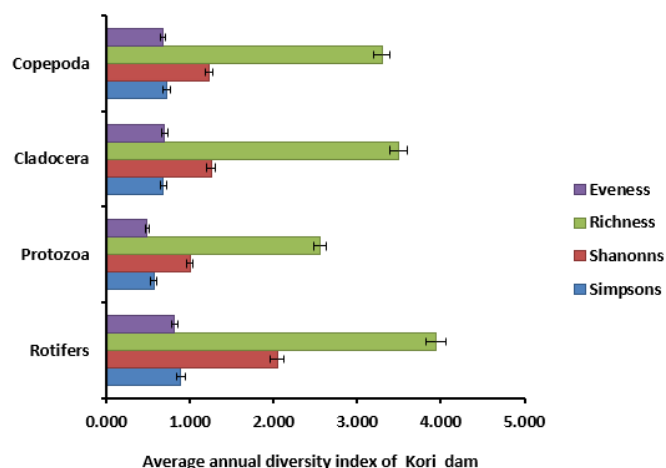


Fig 2. Average annual diversity indices of different Zooplankton groups in Kori Dam, Bilaspur, Chhattisgarh during July 2022 to Dec-2023.

CONCLUSION

The wide variety of zooplankton groups found, this study indicates that the Kori Dam has been experiencing an increase in organic substances, which could lead to its deterioration over time. Kori dam is under increased pressure from visitors and pilgrims. The local residents and pilgrims who utilize these dams for bathing and washing appear to contribute a significant amount of external material to these dams. This increase in organic material in Kori Dam might cause significant degradation of this asset in the future. The continuous growth of human communities could lead to the rapid deterioration of these dams in the future. Creating awareness among marginalized communities and travelers is necessary for effective conservation efforts.

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